2003 Joint Services Small Arms Systems Section Annual Symposium, Exhibition and Firing Demonstration

M249 SAW Short Range Training Ammunition (SRTA) Bolt Adaptor

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M249 SAW SRTA Bolt Adaptor

MOUT Training with the SAW

NEED: Train with M249 Squad Automatic Weapon (SAW) using M862 SRTA in Military Operations in Urban Terrain (MOUT) environments

CHALLENGE: M862 SRTA is designed for use in the M16 with the M2 Bolt Adapter thus it is not powerful enough to cycle the M249 SAW which fires from an open bolt.

M249 SAW SRTA Bolt Adaptor

SRTA Bolt Adaptor

- **SOLUTION**- Design a bolt adaptor to enable M249 SAW to shoot M862 SRTA For enhanced training capability.
- The Current SAW SRTA Bolt Adaptor consists of the following modified parts:

  -Bolt

  -Slide

  -Operating Rod

  -Gas Regulator

  -Spring

- These parts would be “swapped” with original SAW parts

M249 SAW SRTA Bolt Adaptor

Math Model For SAW SRTA Bolt Design_

- In this case, we are dealing with essentially a hybrid blowback operated system due to some impulse coming from the gas port. The gas pressure at the port measured on average for the M862 SRTA was 3,500psi. This is roughly only one third of the 15,500psi exerted by the M855 heavy ball ammo normally used in the M249 SAW.

- The following equations deal with the impulse created by blowback: The energy of a body or system is its capacity for doing work. The kinetic energy of a body of weight W and mass W/g, moving with a velocity V, is given by

$$K.E. = \tfrac{1}{2}(W/g)V2 = \tfrac{1}{2}M\ V2$$

There is the kinetic energy of the projectile, the gases coming from the propellant charge, and both are transferred to the bolt in recoil.

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Math Model For SAW SRTA Bolt Design

- The velocity of the charge, Vc, is equal to one-half the projectile velocity at the muzzle, assuming the powder gas expands at approximate one –half the rate of the projectile velocity.

- The impulse of a force is the product of the force and the time that it acts on a body.

$$I = F*t$$

- The momentum of a body of weight W and velocity V is given by

$$(W/g)V = MV$$

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Math Model For SAW SRTA Bolt Design_

- The change of momentum of a body equals the impulse producing the change.

$$F*t = (W/g)*(V2 - V1) = MV2 - MV1$$

- The following equation translates the conservation of energy to the blowback operation:

$MrVr = Mp*Vp + McVc$ where r= recoil; p= projectile; & c= charge

From these equations the bolt weight and energy can be found. All velocities and masses can be obtained empirically within parameters to reach the desired goals.

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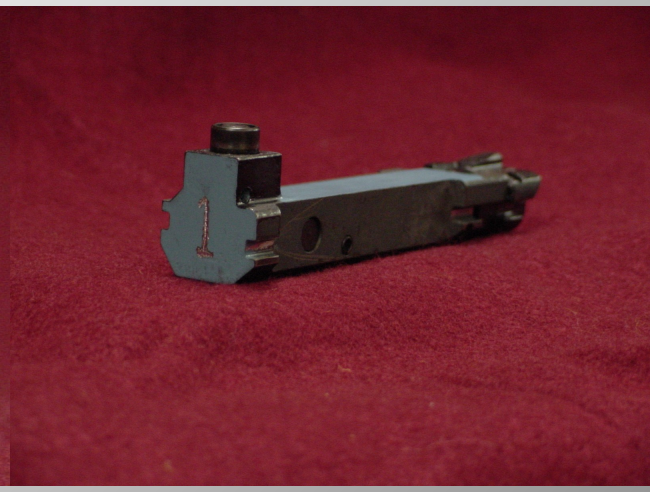
Bolt and Bolt Slide

- The Bolt and Bolt Slide were modified as follows:

  -the Bolt-face base diameter was reduced in order to accommodate the smaller cartridge base of the 5.56 SRTA. This also prevents standard rounds from being accidentally fired

  -the Bolt is fixed to the Slide and does NOT turn and lock in the barrel extension (this creates the blowback operation)

  -the Slide was trimmed down to reduce weight and increase opening velocity of the bolt group



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Op-Rod Assembly

- The Operating Rod assembly was modified as follows:

  -the entire assembly was trimmed to reduce overall weight of the operating group

  -the Gas Piston was enlarged to create more volume and also extend the time in which the piston remains sealed with the Gas Regulator

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Gas Regulator

- The Gas Regulator was modified as follows:

-the Gas Regulator diameter was enlarged to create a seal with the new Gas Piston and also added one-half inch of overall length to maintain the seal for a longer period of time

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Spring

- The Spring was modified as follows:

  -a standard triple wound coil spring was reduced in length and number of coils in order to reduce the potential energy and allow the less powerful energy from the SRTA to cycle the weapon properly.

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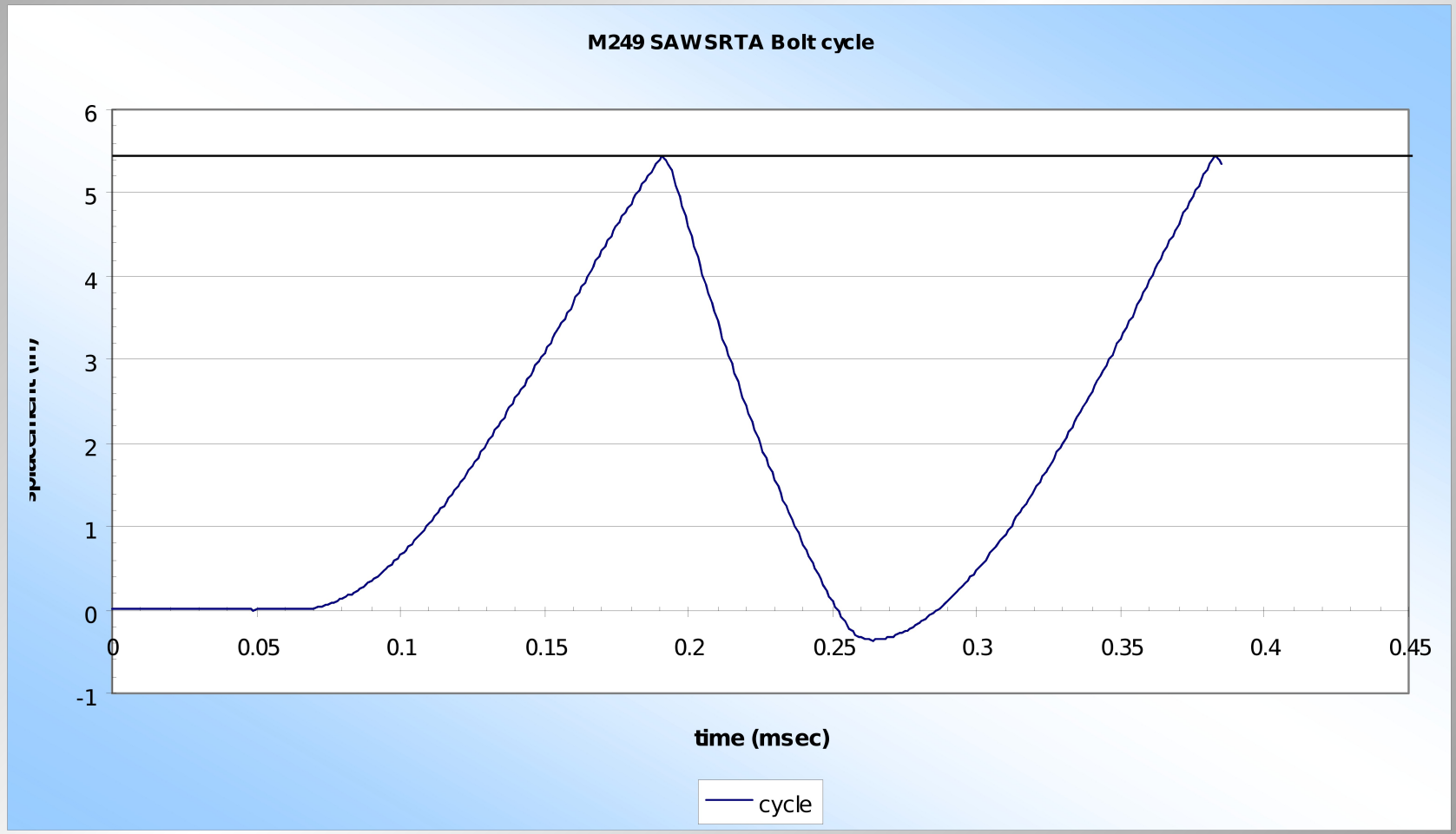
Time/Displacement Curves



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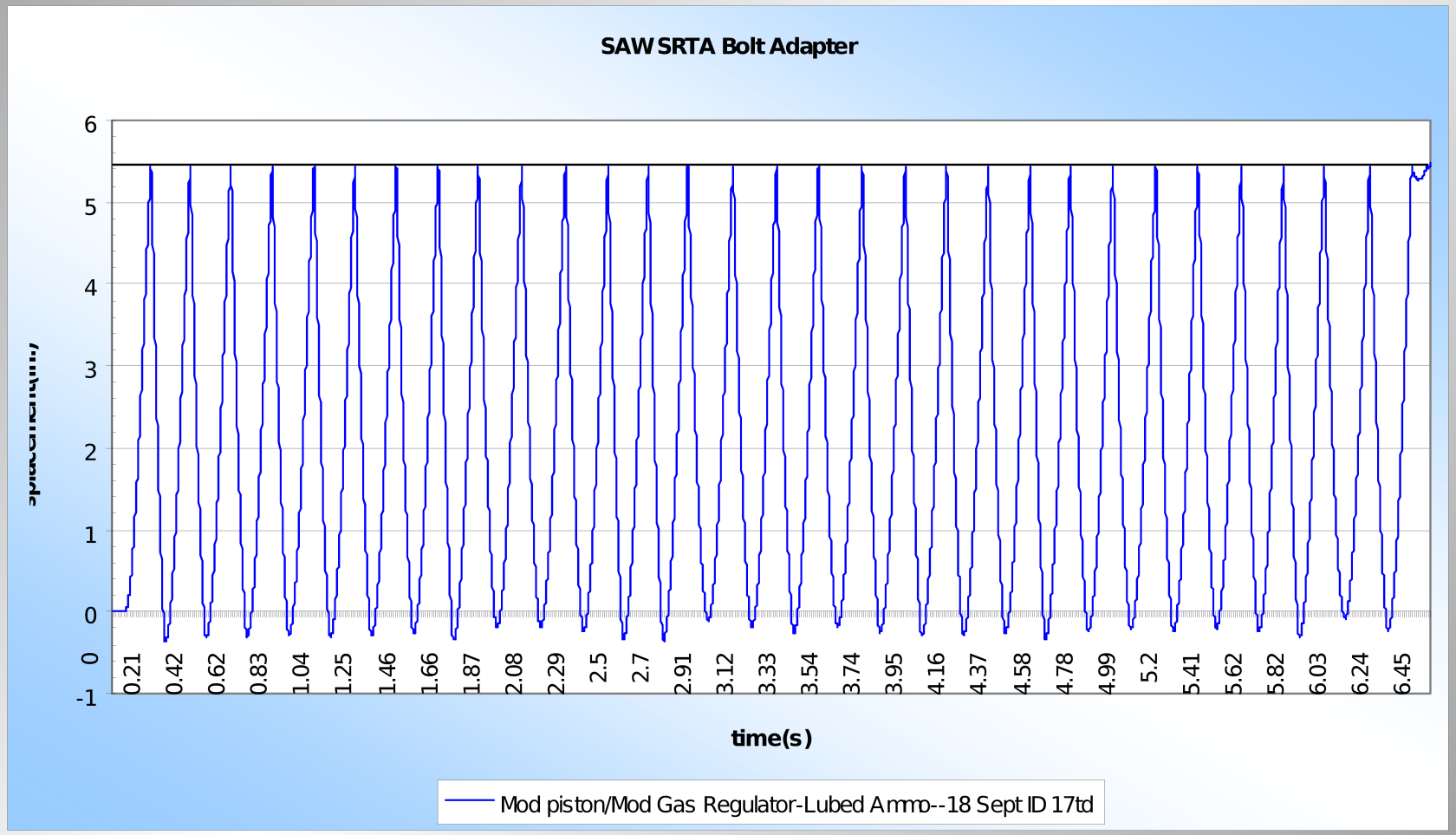

M249 SAW SRTA Bolt Adaptor

Linked M862 5.56 SRTA

- JRTC recieved100k rounds for initial issue provided by ARDEC.
- Linked 5.56 SRTA is packaged in standard SAW ammo configuration.-
- The Linked 5.56 SRTA MUST BE WETLUBRICATED.

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Key Points

- LUBRICATION ALWAYS NEEDED before shooting 5.56 SRTA in the M249 SAW on both the ammunition and the weapon
- Smooth-least friction bolt operation is a MUST for consistent fire.
- Future work to improve system and provision for “Big Army” has been approved April 03 Sponsored by STRICOM.
- Possible Improvements for the new system design include: